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[57] ABSTRACT
Procedure for the production of structured Mikrotripel reflex surfaces in cube-similar structure from plastic or glass in the form of retroflecting molded articles, plates, sheet commodity, labels, flexible elbows and/or upaufwickelbaren foils, which in the Strasssen -, rails -, air and maritime traffic, for signs, for signals, for motor vehicle reflectors, for bicycle reflectors, for warning triangles, for Strasssenleitpfosten, for Strasssenmarkierungsknoepfe, for person reflectors at clothes or bags, in which space travel, in which optoelectronics, in which Messs and automatic control are used, in control engineering and for decorations.

DESCRIPTION

Tripelreflektoren find as reflectors in the Strasssenverkehr, at motor vehicles and in optoelectronics in many execution forms application. The US patent specification 269760 and 1211027 describe the tools for the production of a particularly efficient Tripelreflektors in wuerfelform.

However, dasss this wuerfelfoermige Tripel showed up with laterally irradiating light three preferred directions possesses, like that dasss reflection for example in the Strasssenverkehr to the sides of the reflector depending upon position around the rotation axle of the Tripel is ungleichmaesssig.

One tried this to eliminate by dividing the Tripelflaechen, by equipping the patches with Tripeln of changing position. Naturgemaesss grossse non-reflecting surfaces between the individual patches developed. The actually efficient Tripelsystem was thus decreased by allocation in patches in the whole of its reflection achievement substantially.

During far-angular view failed then for example half of the Tripelflaechen. By the reflector suddenly only the half reflector was visible for example with two Tripelflaechen, which are connected by a

crown.

With the education of grossser reflector surfaces the same arose, dasss the production-determined, in the Groessse thus limited patches, grossse non-reflecting gaps formed. A reason, why one did to a large extent until today without largelaminar signs with reflector surfaces from the actually most efficient wuerfelfoermigen Tripelsystem. A smooth large surface to form, was not possible.

The German patent specification 2159950 suggested toothing the reflectors complementary with one another according to the Tripelmuster. In technical practice however, dasss to other was smaller, actually however the achievement of the Tripel at the edges pointed itself the transitions of a patch was smaller than due in the center of the patches to the finishing technique of individual reflectors without edge. Besides the many rimless reflectors musssten altogether between glass plates to be included, in order to protect the Tripel against contamination and humidity. An uneconomic procedure, which resulted in enormous weight problems and new Groesssenbeschraenkungen from the glass plates.

Presented with the German patent application P 4236799,9 a procedure, how one can in such a way manufacture the efficient Tripel in wuerfelform, dasss also very small Tripel to produce for the first time are. That will help to reduce erwartungsgemaesss the reflectors in their material thickness.

Task of the erfindungsgemaesssen procedure is it, largelaminar retroflecting surfacesurface surfaces from Mikrotripeln with higher to produce for never dagewesener effecteffect effect which appear for the observer for example in the Strasssenverkehr as smooth and gleichmaesssig. With this procedure the organization is suggested at the same time of for the observer still as appearing gleichmaesssig far angular surfacesurface surfaces.

Fig. 1 shows a wuerfelfoermigen Mikrotripel (1) seen from above. The rectangular surfaces (5), (6) and (7) stand so to each other, dasss incident light are returned and thereby retroreflektiert. The cross section of the Mikrotripels is a hexagon. The highest points of the Mikrotripels are the points (8). The deepest point of the Mikrotripels is (9).

Fig. 2 shows the Mikrotripel (2), which corresponds actually only to a turn of the Mikrotripels (1) around 60° around its rotation axle (9) in the clockwise direction.

Fig. 3 shows the Mikrotripel (3), which corresponds to a turn of the Mikrotripels (1) around 30° around its rotation axle (9) in the clockwise direction.

Fig. 4 shows the Mikrotripel (4), which corresponds to a turn of the Mikrotripels (1) around 90° around its rotation axle (9) in the clockwise direction.

Since each Mikrotripel has three far-angular directions, to which also the edges of the Mikrotripels point after ausssen, can thus by

arbitrary combination of several Mikrotripel (1), (2), (3) and/or (4) the total number of all directions be increased. If two Mikrotripel are combined, results in this six directions, all four represented Mikrotripelpositionen are combined, arise twelve directions. By further introduction of Mikrotripeln to other turning positions, the number of the total quantity of the far-angularly attainable directions leaves itself at will vergroesssern. For practice for example in the Strasssenverkehr six directions are already sufficient.

If one wants to reach a far angularness in a circular arc of for example 180° for example only, one positions the Mikrotripel dasss only the desired circular arc far-angularly is accordingly, thus lit up.

Fig. the arrangement of two Mikrotripel points 5 in groups to a closed reflex surface. The regelmaesssig repeating group (11) is formed from Mikrotripeln (1) of the turning position in Fig. 1. Likewise the regelmaesssig repeating group (12) of Mikrotripeln of the turning position (2) is formed. The patches forming groups are practically smoothly adjacent (10). The patches are thus closed groups of same Mikrotripel. The entire represented Mikrotripel Reflexflaeche has altogether six far-angular directions. If the surface is far-angularly lit up now and moved thereby, all patches or only in each case half of all groups will light up in each case, depending upon beam of light and viewing angle.

If now thus only half of the groups shines, the reflex achievement is decreased by 50%. (in former times became with reflectors with Tripeln of 4 mm in diameter and Gruppengroesssen of for example 20 mm with this example lightdarkly a chessboard sample recognizable, dasss for sign surfaces disturbing and unsuitable are.)

By the erfindungsgemaessse use of Mikrotripeln, which amount to clearly smaller in the diameter than 0.8 mm, and by the restriction of the Gruppengroessse of the Mikrotripel, the straight non becomes bright groups points between bright points. The eye of the observer cannot dissolve this difference between the bright and nonluminous points any longer. Accordingly the Gruppengroessse the intended purpose and the distance can be selected to the observer.

A second effect been based on it, dasss Mikrotripel in wuerfelform substantially brighter are than micro prisms in pyramid form or conventional reflectors with wuerfelfoermigen Tripeldurchmessern from usually 2 mm to 4 mm. This technical maximum performance of wuerfelfoermigen Mikrotripeln by the better attainable sharpening or gumption accuracy obtained opposite conventional Tripelsystemen.

This higher light reflex achievement uses the erfindungsgemaessse procedure. If thus the eye of the observer cannot observe the sudden loss in the Weitwinklichkeit of individual groups, because these are too small for the eye, then only the observation of the reduction of the light reflex achievement of the reflex surface remains in its whole. Here however the inventor goes out with observing dasss the reduction of the reflex achievement around 50% hardly still with the human eye is. The human eye recognizes much better contrasts than

absolute light quantities. Thus if the Mikrotripel Reflexflaeche loses by sudden loss of 50% of all groups at reflected quantity of light, then this remains a quantitative Groessse of the quantity of light. The comparison is missing to the eye opposite the full-reflecting total area for contrast evaluation.

Still more is reduced the loss of reflex achievement, because the quantity of light is particularly high with erfindungsgemaesss the suggested Mikrotripeln. A reduction around 50% could be observed with simple micro pyramids substantially more clearly and thus more disturbing, since the pyramid systems possess substantially small light reflex achievement. With the sinking of the initial parameter " luminous intensity " the eye can compute the light quantities better, by judging the contrast in relation to a completely dark surface. Example: One sees the cigarette glow mile far at the night, with dawn requires it however already strong headlight, in order to be seen.

A further reduction of the observability of brightness differences by loss of reflex patches is reached by the selection of further Mikrotripelpositionen.

Fig. the cutout of a Mikrotripel reflex surface shows 6, with which now four turning positions of the wuerfelfoermigen Mikrotripels are used. The group (11) consists of Mikrotripeln (1) the Fig. 1. The group (12) from Mikrotripeln (2) the Fig. 2. The group (13) from Mikrotripeln (3) the Fig. 3. The group (14) from Mikrotripeln (4) the Fig. 4. The groups are partially into one another interlocked at the boundary (10). Partially free spaces (15) are between the groups. In this example four turning positions were used by Mikrotripeln (1), (2), (3) and (4). Thus the total area, if after all sides the different groups repeat themselves, has twelve far-angular directions. The loss of reflecting surface is reduced on 25%, because in each case a kind of group precipitates depending upon observation direction.

If one goes out in this example with it, dasss the used diameters of the Mikrotripel 0.1 mm amounts to, then the represented total area of the Fig. would have 6 only approx. 3.84 mm2. This Mikrotripel Reflexflaeche structured from six punctiform groups would not be to be observed on a traffic sign over that the roadways of a motorway neither at day nor at night in the change of the reflex achievement, more aussser one moves aussserhalb the limit angle, like that dasss a retroreflection would be possible.

Fig. an example with four groups (11) shows 7, (12), (13) and (14) the Mikrotripel (1), already described, (2), (3), (4), whereby groups of Mikrotripeln other groups of umfliesssen and/or several groups a group einschliesssen. By such structuring reflecting surfaces, for example foils on describing, can then constituted, dasss they could not be dissolved also with daylight and very close view in their group structure by the human eye.

Patent claims

1. Procedures for the production of structured Mikrotripel reflex surfaces thereby characterized, dasss the retroflecting Mikrotripel (1), (2), (3), (4) are cube similar and a diameter from 0.002 mm to 0.8 mm have and in groups of same Mikrotripel are zusammengefassst, whereby the diameter of the groups is smaller than 7 mm and at least two groups and/or more form the reflex surface.

2. Procedures for the production of structured Mikrotripel reflex surfaces thereby characterized, dasss the retroflecting Mikrotripel (1), (2), (3), (4) from three to each other arranged square surfaces of same and/or unequal Groessse exist; in order to reflect the incident ray of light.

3. Procedures for the production of structured Mikrotripel reflex surfaces thereby characterized, dasss the Tripel (1, 2, 3, 4) in the cross section the form of an equilateral hexagon possess.

4. Procedures for the production of structured Mikrotripel reflex surfaces thereby characterized, dasss the retroflecting surfaces a cube-similar structure show, which is similar to standing or bent cubes on the point, whereby the Mikrotripel appearing as cubes is arranged to groups of same and/or unequal Groessse.

5. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 4 thereby characterized, dasss the retroflecting groups of the Mikrotripel to the source of light are aligned and/or up to 30° are deviating from the incident light aligned.

6. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby characterized, dasss the groups of the Mikrotripel in different heights to each other to be arranged can, as for example curved and/or bent surfaces and/or space body are formed.

7. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby characterized, dasss the groups of the Mikrotripel to each other to be rotated arranged know, like that dasss a group or several groups to the neighbouring group around 5°, 7,5°, 15°, 30°, 45°, 60°, 90° or 180° around their rotation axle are turned.

8. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby characterized, dasss the groups of the Mikrotripel in the way (10) to be interlocked with one another can, dasss between them no gap remain, as for example in (Fig. 5) or (Fig. 6, surface 13 and 14).

9. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby characterized, dasss some or all groups of the Mikrotripel in the way to be to each other arranged can develop, dasss free spaces (15) from width to the three-way Mikrotripeldurchmessers.

10. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby characterized, dasss the groups of the Mikrotripel in repetitive or not repeating structures and/or distances are to each other arranged, for example (Fig. 5), (Fig. 6) and/or (Fig. 7).

11. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby characterized, dasss the retroflecting surfaces upaufwickelbare foils, elbow, sheet commodity, labels and/or cutting or punching hurry from the mentioned are.

12. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby characterized, dasss the retroflecting surfaces molded article or plates are, which is manufactured in the casting procedure, in injection moulding or embossing procedure and/or cutting or punching hurry of the molded articles mentioned and/or plates are.

13. Procedure for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby characterized, dasss the products provided with the groups of the Mikrotripel to the retroreflektiven and/or vague light reflection in the Strasssen -, rails -, air and maritime traffic, for signs, for signals, for motor vehicle reflectors and bicycle reflectors, for warning triangles, for Strasssenleitpfosten, for Strasssenmarkierungsknoepfe, for person reflectors at clothes or bags, in which space travel, in which optoelectronics, in which Messs and inspection technique, control engineering are used and/or for decorations.

14. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby characterized, dasss the reflecting surfaces from transparent or transparent plastic or glass are manufactured.

15. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby to be marked, dasss the reflecting surfaces by their formed back to a source of light be arranged know, thus dasss this light the foil from the rear penetrate, if the source of light expires, but the surface the light hitting from the front remain partially or completely retroflecting visible.

16. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby characterized, dasss the reflecting surfaces on their formed back to be reflected can by evaporating metal, like aluminum, copper, silver or gold and/or their connections, or by lacquer finish with reflecting ground connection, like titanium dioxide.

17. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 thereby to be marked, dasss the reflecting surfaces on their formed back by a box or dry film resist air and be waterproof taken off can result in, for example from Verschweisssen or sticking together at the edges of the surfaces and/or in gleichmaesssigen patches, thus dasss the welding seams or connections a raster.

18. Procedures for the production from structured Mikrotripel reflex surfaces according to requirement 1 to 5 and 17 thereby characterized, dasss the Schweisss or sticking seams between the back of the reflecting surfaces and the dry film resist the dividing lines (10) of the groups of the Mikrotripel follow.

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GB	9 18 015
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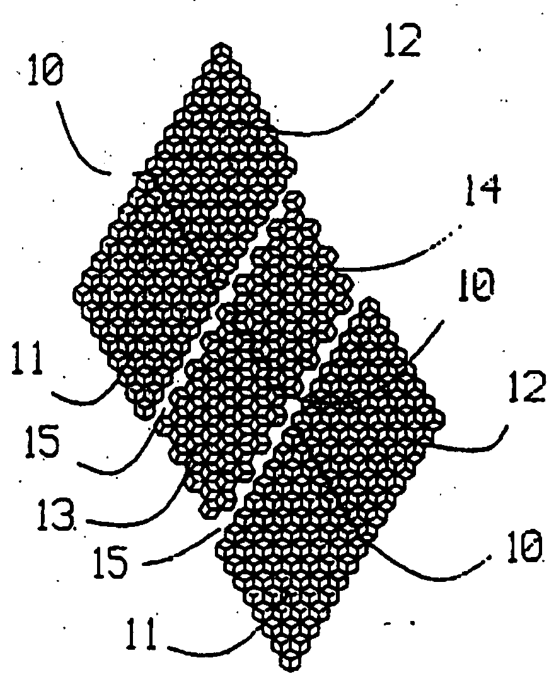
(54) Aus einer Vielzahl von Mikrotripeln bestehende Rückstrahlerfläche

(57) Aus einer Vielzahl von Mikrotripeln bestehende Rückstrahlerfläche, bei der
- die einzelnen Mikrotripel (1, 2, 3, 4) jeweils aus drei aneinander angrenzenden quadratischen Flächen (5, 6, 7) einer Würfelecke gebildet werden und die Projektionsfläche der einzelnen Mikrotripel (1, 2, 3, 4) auf die Rückstrahlerfläche jeweils ein gleichseitiges Sechseck bildet, dessen Diagonale eine Länge von 0,002 mm bis 0,8 mm aufweist,
- jeweils eine Mehrzahl benachbarter Mikrotripel (1, 2, 3, 4) eine einheitliche Drehorientierung zu der von der Raumdiagonalen der Würfelecke gebildeten Drehachse aufweisen und Teilflächen (11, 12, 13, 14) mit Mikrotripeln gleicher Drehorientierung bilden, wobei die Teilflächen (11, 12, 13, 14) jeweils einen Durchmesser von weniger als 7 mm haben,
- eine Mehrzahl derartiger Teilflächen (11, 12, 13, 14) mit jeweils unterschiedlicher Drehorientierung der Mikrotripel (1, 2, 3, 4) benachbart zueinander angeordnet sind, und bei der
- eine Vielzahl derartiger Flächenbereiche aus mehreren jeweils benachbarten Teilflächen (11, 12, 13, 14) die gesamte Rückstrahlerfläche bilden.



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PATENT APPLICATION DE 42 40 680 C2

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Reflector Surface Consisting of a Large Number of Microtriples

Abstract

Described is a reflector surface, consisting of a large number of microtriples, in which

- the individual microtriples (1, 2, 3, 4) are formed, in each case, from three square surfaces (5, 6, 7) of a cubical corner that are adjacent to each other; and the projection surface of the individual microtriples forms--on the reflector surface--in each case, an equal-sided hexagon whose diagonal has a length of 0.002 - 0.8 mm;

- the majority of adjacent triples (1, 2, 3, 4) have, in each case, a uniform orientation of rotation to the rotational axis, which is formed by the space diagonal of the cubical corner, and partial surfaces (11, 12, 13, 14) with micro-triples having the same orientation of rotation, while the surface sections (11, 12, 13, 14) have, in each case,a diameter of less than 7 mm;

- a majority of these kinds of surface sections (11, 12, 13, 14) with, in each case, a different orientation of rotation of the microtriples (1, 2, 3, 4) are arranged adjacent to each other; and in which

- a large number of these kinds of surface areas consisting of several surface sections--which, in each case, are adjacent to each other--form the entire reflector surface.

Description

The invention relates to a reflector surface that consists of a large number of microtriples. Triple-reflectors find application in many embodiments as reflectors in traffic, on vehicles, and in opto-electronics. GB patent specifications 269 760 and 1 211 027 describe the tools for producing an especially effective triple reflector in the form of a cube.

However, it turned out that, with light coming in from the side, this cube-shaped triple has three directions of preference, so that--for instance, in traffic--the reflection to the sides of the reflector is irregular around the rotational axis of the triples depending, in each case, on the position.

Efforts have been made to eliminate this by dividing the triple surfaces by equipping the surface sections with triples in a changed position.

Naturally, large non-reflecting surfaces developed between the individual surface sections. Therefore, by dividing it into surface sections, the actually effective triple system was considerably reduced in the totality of its reflective performance.

For instance, when viewed at a wide angle, half of the triple surfaces were lost. From a reflector, for instance, with two triple surfaces connected with each other by an apex vertical, suddenly only half of the reflector was visible.

During the formation of large reflector surfaces, the same occurred; the surface sections which, due to production conditions, were restricted in size, formed large non-reflecting intermediate spaces. This is one reason why, largely until now, one did without large-surface signs with reflector surfaces consisting of the actually most efficient cube-shaped triple system. It was impossible to construct a seamless large surface.

US-PS 4 202 600 relates to a reflector in which the cube corners all have the same orientation. Although, in the pyramid construction, a rotation of the cubes can be recognized, here it concerns only a single angle of rotation--that is, random distribution of the different angles of rotation of the cubes over the entire reflector surface is not possible in the above-mentioned arrangement.

US-PS 2 676 518 relates to a circular reflector in which individual areas with the shape of a circle segment are studded with microtriples that are formed, in each case, by three square surfaces of a cube corner that are adjacent to each other. However, the individual microtriples are not rotated with respect to the surface segment but the different orientation of the microtriple over the surface results from a shift of the segment, which is the same in each case, by 60°.

DE-PS 25 59 950 proposed to complementarily interlock the reflectors according to the triple pattern. However, in practice it turned out that the transition from one surface segment to another were smaller but that actually the efficiency of the triples at the edges was smaller than in the center of the surface segments, depending on the finishing technique of the individual reflectors without an edge. In addition, the large number of edgeless reflectors have to be included between glass plates to protect the triples against dirt pick-up or moisture. This is an uneconomical process that, due to the glass plates, results in tremendous weight problems and new size restrictions.

The present invention is based on the task of creating a reflector surface that retroreflects over a large surface and that has a high retroreflectivity that is uniform for the observer, even when illuminated under different angles.

To solve the problem, a reflector surface according to patent claim 1 is proposed. The reflector surface according to the invention has the special advantage that, for instance, signs for road traffic can be produced from it that, because of their structure, have a high retroreflectivity that is uniform for the observer, also when illuminated under different angles.

The subclaims represent advantageous further developments of the reflector surface according to the invention. The reflector surface according to the invention will be explained in more detail using the drawings exemplifying preferred embodiments.

Fig. 1

shows a cube-shaped microtriple (1) seen from the front. The rectangular surfaces (5, 6, and 7) are positioned with respect to each other in such a manner that incident light is deflected and thereby retroreflected. The cross-section of the microtriple in the plane of the paper is a hexagon. The highest point of the microtriple is point (8). The lowest point of the microtriple is (9).

Fig. 2

shows the microtriple (2), which is generated by rotating the microtriple (1) by 60°, clockwise, around the axis of rotation that runs through point (9) and points upward vertically out of the plane of the paper.

Fig. 3

shows the microtriple (3), which is generated by rotating the microtriple (1) by 30°, clockwise, around the axis of rotation that runs through point (9).

Fig. 4

shows microtriple (4), which is generated by rotating the microtriple (1) by 90°, clockwise, around the axis of rotation through point (9).

Therefore, because each microtriple has three wide-angle directions in which also the edges of the microtriple point outward, the total number of all directions can be increased by any combination of several microtriples (1, 2, 3, and/or 4).

If two of these microtriple orientations are combined, the result is six directions; if all four represented microtriple positions are combined, twelve directions result. By leading the microtriples in other directions of rotation, the total number of directions attainable under a wide angle can be increased arbitrarily. In practice--for instance, in traffic --six directions are sufficient. If one wants to attain, for instance, only a wide angular capacity in a segment of a circle of, for instance, 180°, the microtriples are positioned in such a manner that only the desired segment of a circle is illuminated under a wide angle.

Fig. 5

shows the arrangement of two microtriple orientations in surface segments into one closed reflector surface. The surface segment (11), which is repeated regularly, is formed from microtriples (1) in the position of rotation according to Fig. 1. Also the surface segment (12), which is repeated regularly, is formed by microtriples of the position of rotation (2) according to Fig. 2. The surface segments are joined together practically without seam (10).

Therefore, the surface segments are closed groups with microtriples of the same orientation of rotation. The entire total represented microtriple-reflect surface has a total of six wide-angled directions. If this surface is illuminated under a wide angle and moved in the process, either all surface segments or only half of all surface segments will light up, depending on the incidence of light and the angle of observation.

If only half of the surface segments lights up, the reflective efficiency is reduced by 50%. In the past, a bright/dark chessboard pattern, which is disturbing and unsuitable for signboard surfaces, could be recognized on reflectors with triples with a diameter of 4 mm and sector sizes of, for instance, 20 mm in this sample.

In the case of the diameter of the microtriple, it concerns the diagonal of the hexagon that results when the cube is projected on a corner. By using microtriples that, in diameter, are clearly smaller than 0.8 mm, and by restricting of the size of the sectors, the groups that do not light up with unfavorable lighting particles become points between light points.

The eye of the observer is no longer able to resolve the difference between the points that light up and the points that do not light up. In addition, the size of the sector can be chosen according to the application purpose and the distance to the observer.

A second advantage of the development according to the application is based on the fact that microtriples in a cube-shape are of a substantially higher luminosity than micro-triples in the shape of pyramids or conventional reflectors with cube-shaped triple diameters of usually 2-4 mm. This advantage, which is connected with the reduction of the dimensions of cube-shaped microtriples, is attained by the higher polishing and cutting accuracy that is made possible by the process described by the applicant in German patent 42 36 799.

The arrangement according to the invention makes use of this higher light reflectivity. If the eye of the observer cannot observe the sudden failure of individual sectors because they are too small for the eye, only the observation of the reduction of the light reflectivity of the reflective surface remains in its totality. However, here the inventor assumes that the reduction of the reflectivity by 50% can hardly be observed by the human eye. The human eye recognizes contrasts much better than absolute light quantities.

Therefore, if, by the sudden failure of 50% of all sectors, the microtriple reflective surface loses an quantity of reflected light, this remains a quantitative parameter of the quantity of light. The eye lacks the comparison with respect to the fully reflected total surface for an evaluation of the contrast.

The drop in reflectivity is reduced even more because the quantity of light in the microtriples proposed according to the invention is especially high. In the case of simple micro pyramids, a reduction by 50% can be observed substantially more clearly--and, thereby, more disturbingly--because the pyramid systems have a substantially lower light reflectivity. With the lowering of the initial parameter (light strength), the eye can calculate the light quantities because it evaluates the contrast against a completely dark surface. For example: The glow of a cigarette is seen for miles during the night; however, in the twilight, strong headlights are needed in order to be seen.

Another reduction of the observability of intensity differences by the drop in reflective sectors is attained by the selection of additional microtriple positions.

Fig. 6 shows the cut-out of a microtriple reflective surface in which four positions of rotation of the cube-shaped microtriple are used. Sector 11 consists of microtriple according to Fig. 1; sector 12 consists of microtriples (2) according to Fig. 2; sector 13 consists of microtriples (3) according to Fig. 3; and sector 14 consists of microtriples (4) according to Fig. 4.

The surface sectors are, in part, interlocked at the separating line (10). In part, there are open spaces (15) between the surface sectors. In this example, four positions or rotation of microtriples (1, 2, 3, and 4) are used. Consequently, if the surface sectors are repeated on all sides, the total surface will have 12 wide-angled directions. The failure of the reflecting surface is reduced to 25% because, depending in each case on the direction of observation, always one group type drops out.

If, in this example, one assumes that the used diameter of the microtriples is 0.1 mm, the represented total surface of Fig. 1 would have only ca. 3.84 mm^2. In this calculation, it is assumed that the surface of a triple is 0.064 mm^2. However, in reality it is precisely 0.64925 mm^2, so that, when rounded off, actually a surface of 0.65 mm^2 would have to be assumed.

The change in reflectivity of this microtriple reflective surface, made up of six almost dot-shaped surface sectors, on a traffic sign above the lanes of a highway could neither be observed during the daytime nor at night unless one would move outside the critical angle so that no retroreflection would be possible.

Fig. 7 shows an example with four surface sections (11, 12, 13, and 14) of the already described microtriples (1, 2, 3, 4), whereas surface sectors of microtriples encircle other surface sectors and/or several surface sectors enclose one part surface. By these kinds of structures, reflecting surfaces--for instance, films on signboards--can be developed in such a manner that, even during daylight and with very close observation, they cannot be analyzed in their part-surface structure by the human eye.

Patent claims

1. The description relates to a Reflector surface, consisting of a large number of microtriples, in which

- the individual microtriples (1, 2, 3, 4) are formed, in each case, from three square surfaces (5, 6, 7) of a cubical corner that are adjacent to each other, and the projection surface of the individual microtriples forms on the Reflector surface, in each case, an equal-sided hexagon whose diagonal has a length of 0.002 - 0.8 mm;

- the majority of adjacent triples (1, 2, 3, 4) have, in each case, a uniform orientation of rotation to the rotational axis, which is formed by the space diagonal of the cubical corner, and partial surfaces (11, 12, 13, 14) with micro-triples having the same orientation of rotation, while the surface sections (11, 12, 13, 14) have, in each case,a diameter of less than 7 mm;

- a majority of these kinds of surface sections (11, 12, 13, 14) with, in each case, a different orientation of rotation of the microtriples (1, 2, 3, 4) are arranged adjacent to each other; and in which

- a large number of these kinds of surface areas consisting of several surface sections--which, in each case, are adjacent to each other--form the entire Reflector surface.

2. Reflector surface according to claim 1, in which the surface sectors (11, 12, 13, 14) are directed to the light source and/or are directed towards the light source with an angular deviation of up to 30°.

3. Reflector surface, according to one of the preceding claims, in which the surface sectors (11, 12, 13, 14) are arranged, relative to each other, in such a manner that, together, they form an arched or a sloping surface, or a space structure.

4. Reflector surface, according to one of the preceding claims, in which the microtriples (1, 2, 3, 4) of adjacent surface sectors (11, 12, 13, 14), relative to each other, are rotated around their axis of rotation by 5°, 7.5°, 15°, 30°, 45°, 60°, 90°, or 180°.

5. Reflector surface, according to one of the preceding claims, in which the surface sectors (11, 12, 13, 14) are developed in such a manner that no intermediate space remains between them.

6. Reflector surface, according to one of the preceding claims, in which the surface sectors (11, 12, 13, 14) are arranged in regular, repeating structures (Fig. 5, Fig. 6) and/or, in irregular, non-repeating structures (Fig. 7).

7. Reflector surface, according to one of the preceding claims, in which the reflector surface is a film that can be wound up, or in the form of a sheet, or a label.

8. Reflector surface, according to one of the claims 1-6, in which the reflector surface is a molded article, a plate, or a cut- or stamped part of a plate or a molded body.

9. Reflector surface according to one of the preceding claims, in which the retroreflective surfaces consist of transparent synthetic material or glass.

10. Reflector surface, according to claim 9, in which the retroreflective surfaces are arranged on the back side of the reflector surface

11. Reflector surface, according to claim 10, in which the retroreflective surfaces have a reflective coating.

12. Reflector surface, according to claim 10 or 11, in which the back side of the reflector surface that has been provided with the retroreflective surfaces is welded or glued, airtight and waterproof, against a case or a cover film.

13. Reflector surface, according to claim 12, in which the welding or glue seams between the back side of the reflector surface and the cover film follow the separating lines (10) between the sectors (11, 12, 13, 14).

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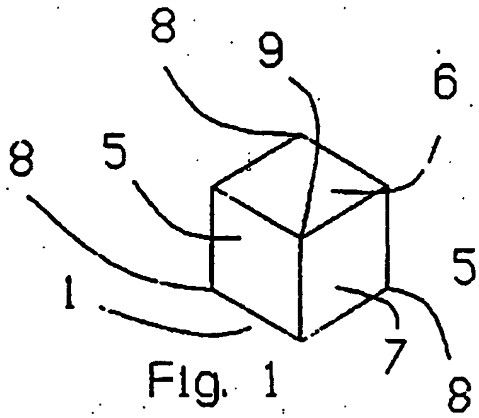

Fig. 1

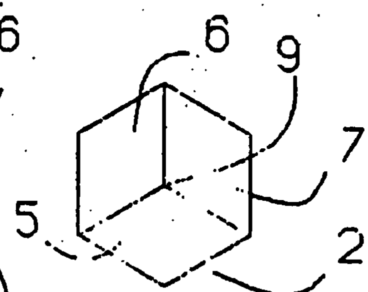

Fig. 2

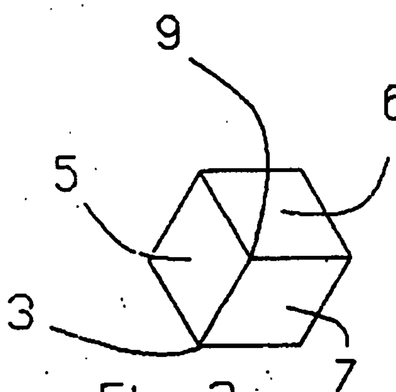

Fig. 3

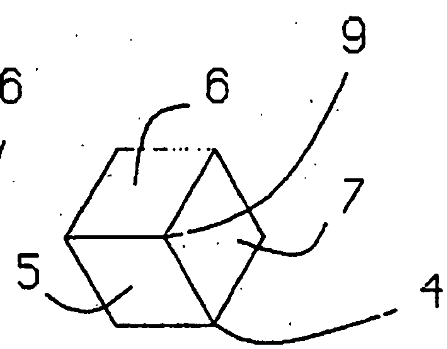

Fig. 4

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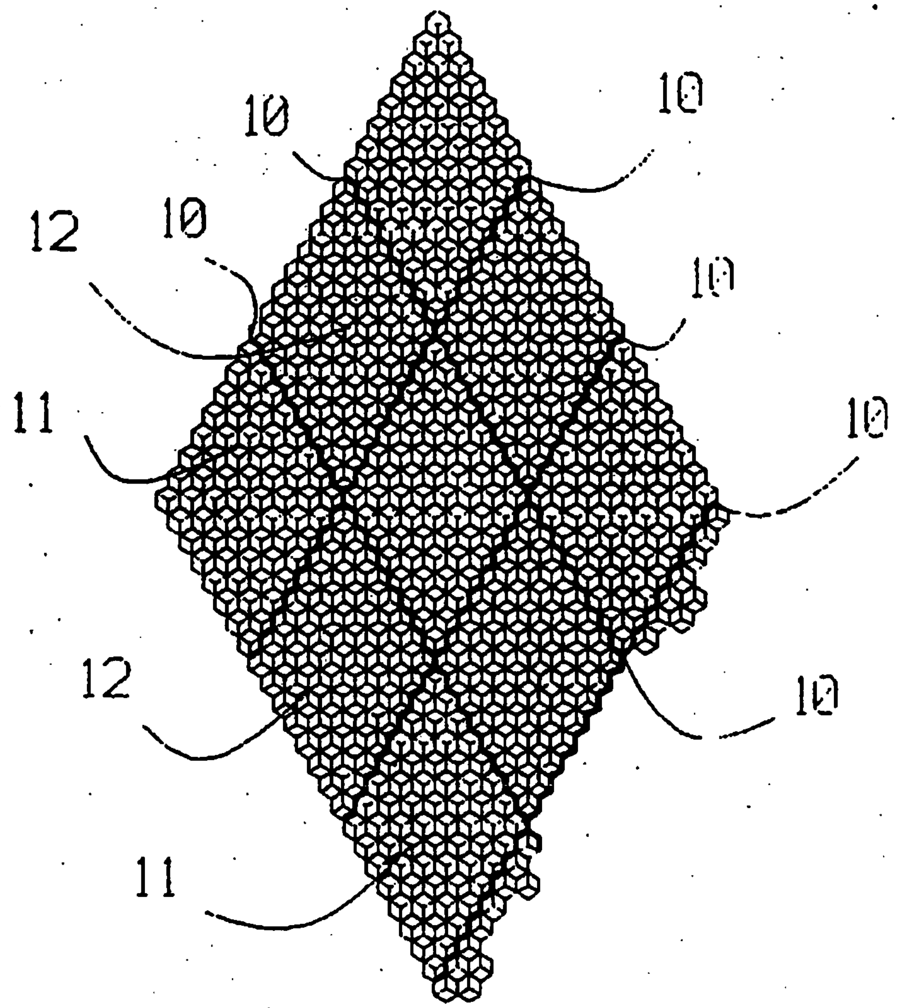

Fig. 5

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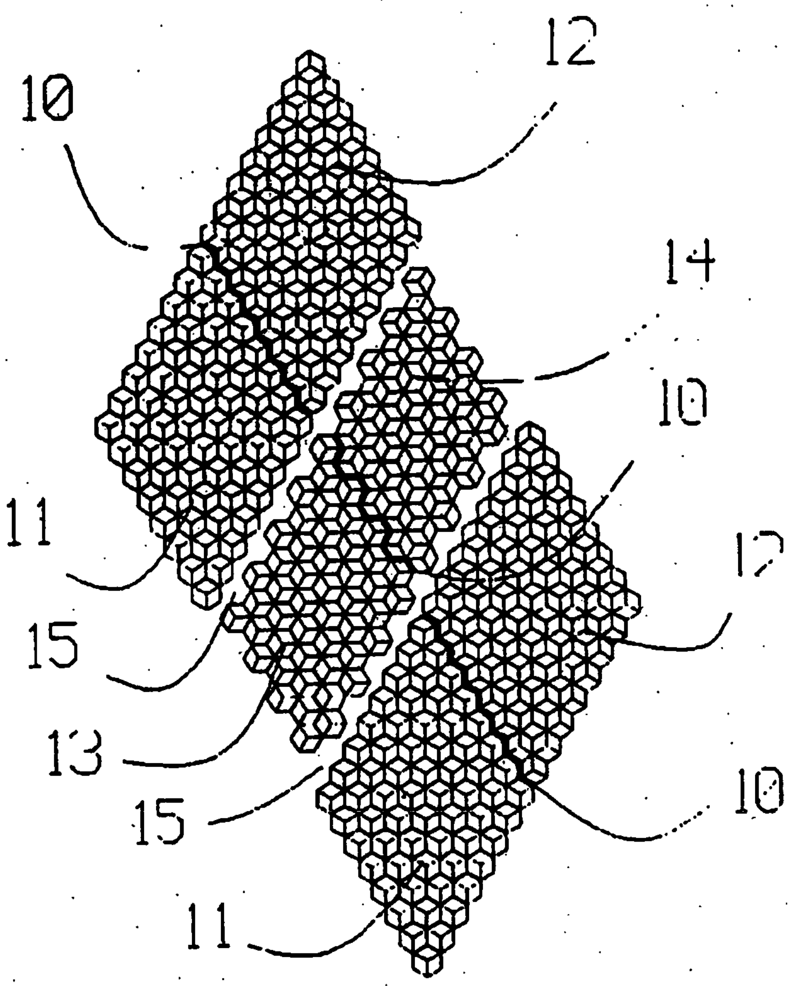

Fig. 6

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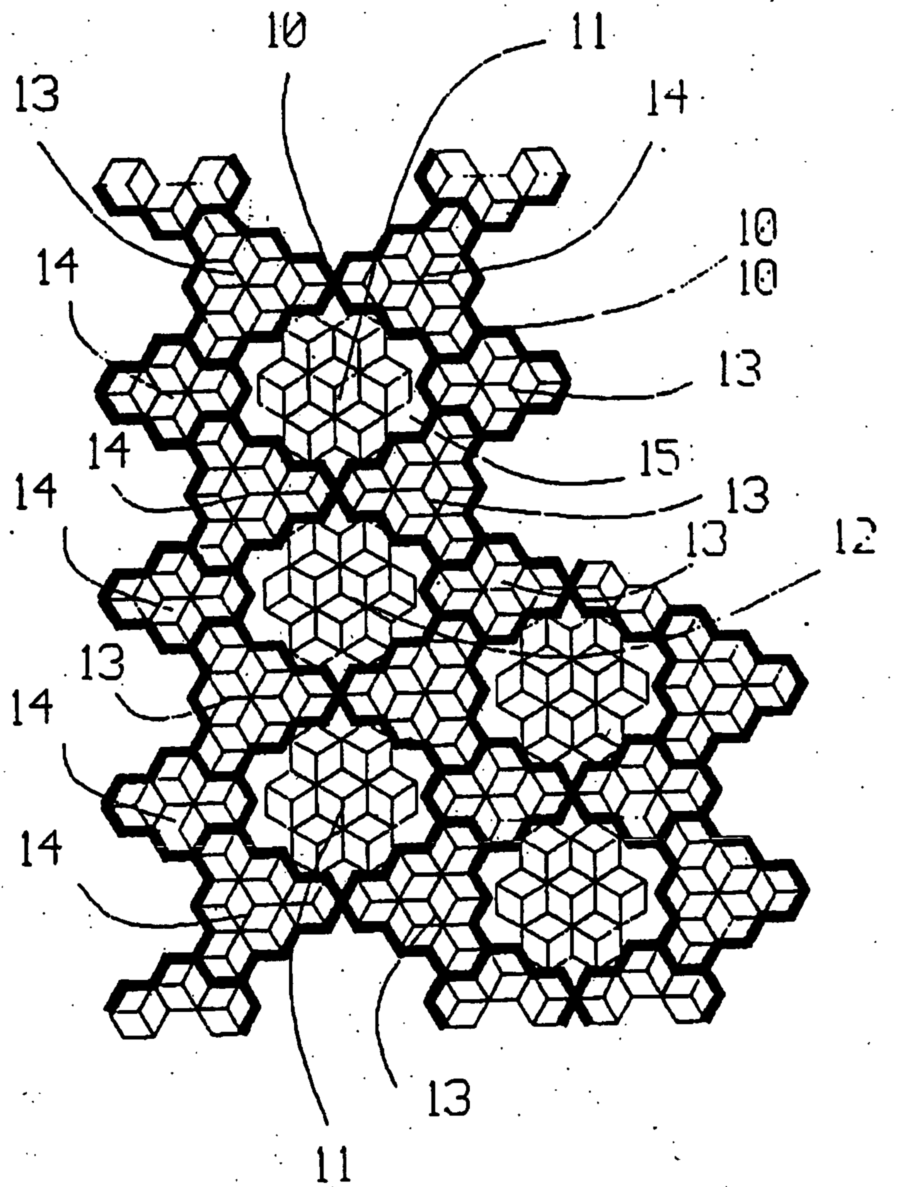

Fig. 7